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OROSTACHYO SPINOSAE-KOELERIETUM MONGOLICAE – A NEW ASSOCIATION OF PSAMMOPHILOUS SWARDS FROM THE *BROMETEA KOROTKYI* HILBIG *ET* KOROLYUK 2000 CLASS IN THE AREA OF MANKHAN-ELYSU (EASTERN SIBERIA)

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Abstract: Studies on psammophilous vegetation in the area of the Mankhan-Elysu sandy complex (Western Trans-Baikal region) were carried out in 2004. Besides three local plant associations described formerly by other authors: *Thesio tuvensis-Festucetum dahuricae* Dulepova *et* Korolyuk 2015, *Corispermo macrocarpi-Leymetum crassinervi* Dulepova *et* Korolyuk 2015, and *Corispermo sibirici-Oxytropidetum lanatae* Dulepova *et* Korolyuk 2015 (=*Oxytropido lanatae-Agropyretum michnoi* Namzalov *et al.* 2017 *nom. inval.*), a new type of sandy sward was identified as a result of the actual syntaxonomic analysis of collected material. This paper presents a formal description and short characteristics of this new association.

Keywords: phytosociology, psammophilous grasslands, new combination of species, *Oxytropidetalia lanatae*, *Festucion dahuricae*, Mankhan-Elysu, Republic of Buryatia

INTRODUCTION

Interest in the flora of Siberia's sandy areas started a long time ago (see Baranov and Sheludyakova 1929; Nazarov 1934 and the literature quoted there). Detailed phytosociological research into xerotermophilous communities following the rules and methods of the French-Swiss school (Braun-Blanquet 1964) started there as late as in the latest decades (Mirkin *et al.* 1985, 1992; Hilbig 1990, 2000; Korotkov *et al.* 1991; Chytrý *et al.* 1993, 1995; Wika *et al.* 1997, 1999, 2000, 2001, 2002, 2003, 2005, 2006a, b, 2011; Buyantuyev *et al.* 1999; Hilbig & Korolyuk 2000; Szczypek *et al.* 2000, 2002, 2005, 2012; Brzeg & Wika 2001; Ovchinnikov *et al.* 2004; Namzalov *et al.* 2012, 2017; Dulepova, Korolyuk 2013, 2015; Dulepova 2014).

In the vast area of the Mankhan-Elysu sandy complex, research into sandy swards has already been conducted by Szczypek *et al.* (2005), Dulepova (2014), Dulepova and Korolyuk (2015) and Namzalov *et al.* (2017). A majority of the phytosociological documentation of the identified psammophilous vegetation

presented in these works may be referred to three validly described associations: *Thesio tuvensis-Festucetum dahuricae* Dulepova *et* Korolyuk 2015, *Corispermo macrocarpi-Leymetum crassinervi* Dulepova *et* Korolyuk 2015 (=*Leymo crassinervi-Artemisietum ledebourianae* Namzalov *et al.* 2017 *nom. inval. p.max.p.*, Art. 3c, 5 ICPN) and *Corispermo sibirici-Oxytropidetum lanatae* Dulepova *et* Korolyuk 2015 (=*Oxytropido lanatae-Agropyretum michnoi* Namzalov *et al.* 2017 *nom. inval.*, Art. 3e, 5 ICPN), representing the alliance of *Festucion dahuricae* Dulepova *et* Korolyuk 2015, the order of *Oxytropidetalia lanatae* Brzeg *et* Wika 2001 and the class of *Brometea korotkyi* Hilbig *et* Korolyuk 2000 (=*Oxytropidetea lanatae* Brzeg *et* Wika 2001 *nom. superfl.*). A detailed syntaxonomic analysis of all the phytosociological relevés made in 2004 (cf. Szczypek *et al.* 2005), supplemented on the basis of verified herbarium specimens, allowed to identify a new type of the phytocenosis of sandy swards from Mankhan-Elysu.

The goal of this article is to present a formal description of the new association, brief flora and habitat characteristics thereof coupled with a discussion of its syntaxonomic position.

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THE RESEARCH AREA

A complex of sandy swards in Mankhan-Elysu (Fig. 1; approximate geographic coordinates: N 50°22', E 107°02') occupies an area of over 20 km^2 and represents a "desert island" amid taiga. It is located on the border of the Selenginsk Uplands in Western Transbaikal (Szczypek *et al.* 2005; Wika *et al.* 2017). Open areas covered with dunes prevail, especially in the central part of the complex where (particularly in depressions and on the fringes) sparse Siberian taiga encroaches with the prevailing *Pinus sylvestris*, locally also shrubs with *Padus avium* and *Salix microstachya*. Parabolic dunes prevail, accompanied by rarer barkhan dunes. These forms are made from local partially mobile, fine-grained aeolian sand from the late Pleistocene and the early Holocene, formed by the northern winds in the past 300 years. This should be attributed chiefly to anthropogenic factors like deforestation and fires (Szczypek *et al.* 2005). It is assumed that the relatively young age of the contemporary terrain is a factor contributing

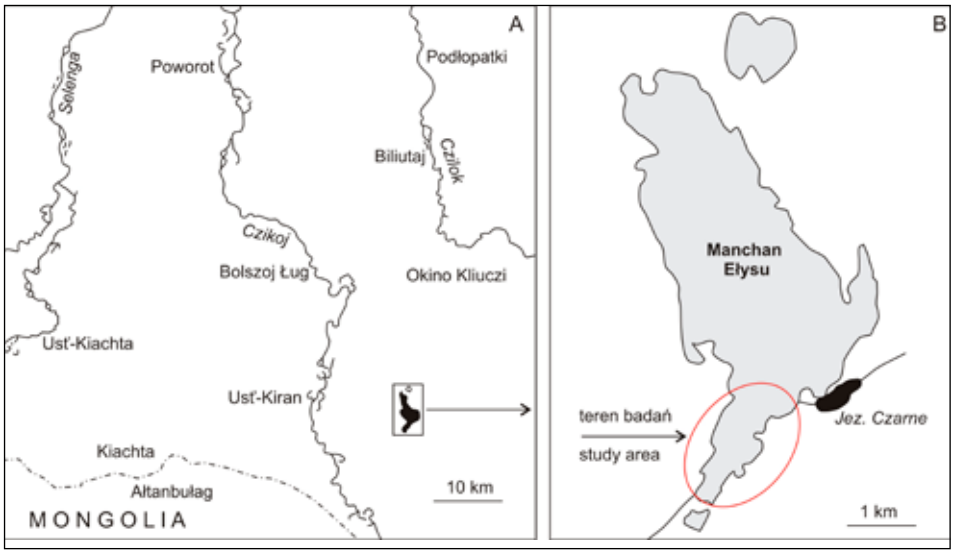

Fig. 1. Location of the Mankhan-Elysu sandy complex (A) and of the study area (B)

to its poor flora, especially terrestrial herbs (approx. 45 species; Szczypek *et al.* 2005; Dulepova 2014; Namzalov *et al.* 2017).

The climate in the region is harsh, dry, typically continental. The average annual rainfall exceeds slightly 324 mm, the average temperature in the summer reaches 19°C, in the winter –22°C. The significant amplitudes of temperature fluctuations are marked by its extreme values: maximum 38.5°C and minimum –40.4°C. In the vegetation period, two seasons: dry and humid can be distinguished (Wika *et al.* 2017).

Vegetation of sandy swards is differentiated with respect to exposition, the angle and the degree of consolidation of the slopes and deflation fields and, first and foremost, the place in the succession process, creating a number of the so-called facies (Szczypek *et al.* 2005; Dulepowa 2014; Dulepowa, Korolyuk 2015; Namzalov *et al.* 2017). These authors indicate the following species of relic steppes and deserts in Central Asia as the most common psammophytes in Mankhan-Elysu: *Aconogonon sericeum*, *Agropyron michnoi*, *Artemisia ledebouriana*, *Bromopsis korotkyi*, *Carex korshinskyi*, *C. sabulosa*, *Festuca dahurica*, *Hedysarum fruticosum*, *Leymus racemosus ssp. crassinervius* and *Oxytropis lanata*.

MATERIAL AND METHODS

The basic material used in this article is represented by six previously not published phytosociological relevés (Tab. 1) made with the Braun-Blanquet

Table 1

Orostachyo spinosae–Koelerietum mongolicae Brzeg *et* Wika 2019 *ass. nova*

Successive No.	1	2	3	4	5	6	
Numer zdjęcia w terenie – Field No. of relevé	59	54	52b	52a	51	31	
Date day	29	29	29	29	29	27	
Date month	06	06	06	06	06	06	
Date year	2004	2004	2004	2004	2004	2004	
Slope exposure	S	E	SE	E	NW	SSW	
Slope iInclination [o]	20	5	3	2	3	25	
Cover of herb layer c [%]	60	70	25	15	10	50	
Cover of moss layer d [%]	20	20	5	10	15	20	
Area of relevé [m^2]	100	30	10	20	40	50	
Number of taxa	8	12	9	10	12	20	
I. Ch., *D. Ass. *Orostachyo spinosae–Koelerietum mongolicae*							
Koeleria cristata ssp. mongolica (Domin) Tzvelev	+.2	2.3	1.2	2.2	2.2	1.3	V
Orostachys spinosa (L.) C.A. Mey.	+	+	2.1	2.1	1.2	+	V
Placynthiella oligotropha (J.R. Laundon) Coppins *et* P.James	2.2	+	+.2	+	1.2	.	V
Ceratodon purpureus (Hedw.) Brid.	.	2.2	1.2	.	+.2	1.3	IV
Bryum caespiticium Hedw.	.	+	+.2	.	+	+.2	IV
Cladonia uncialis (L.) Weber *ex* F.H. Wigg.	.	.	.	1.2	.	1.2	II
Stereocaulon condensatum Hoffm.	.	.	.	1.2	+.2	.	II
Pseudevernia furfuracea (L.) Zopf	.	.	.	.	+.2	2.3	II
Stereocaulon paschale (L.) Hoffm.	.	.	.	.	2.3	.	I
II. Ch. All. *Festucion dahuricae*							
Leymus racemosus ssp. crassinervius (Kar. *et* Kir.) Tzvelev	+	+	.	.	.	.	II
Hedysarum fruticosum Pallas	+	.	.	.	.	1.3	II
III. Ch. O. *Oxytropidetalia lanatae et* Cl. *Brometea korotkyi*							
Carex korshinskyi Kom.	3.4	3.4	2.1	+.3	+.3	1.3	V
Artemisia ledebouriana Bess.	+.2	+.2	+.2	+.2	+.2	+.2	V
Oxytropis lanata (Pall.) DC.		.	+.2	+.2	+.2	.	III
Chamaerhodos erecta (L.) Bunge	.	.	.	.	.	2.3	I
Poa pruinosa Korotky	.	.	.	.	.	+	I
IV. Others							
Pinus sylvestris L. c	.	.	.	r	+.3	r	III
Calamagrostis epigejos (L.) Roth	.	.	+o	.	.	2.3	II
Dontostemon micranthus C.A. Mey.	+	.	.	.	.	+	II
Veronica incana L.		+.2	.	.	.	+.3	II
Crepis tectorum L.	.	r	.	.	.	r	II

Constancy

Sporadic taxa: *Aspicilia sp.* 4(1.2); *Carex pediformis* C.A. Mey 6(+); *Cladonia glauca* Flörke 6(+); *Hieracium umbellatum* L. 2(+); *Moehringia lateriflora* (L.) Fenzl 2(+); *Pulsatilla turczaninovii* Krylov *et* Serg. 6(+); *Scabiosa ochroleuca* L. 6(+).

method (Braun-Blanquet 1964) by the second author in June 2004. The relevés depict homogenous patches of sandy swards occupying areas of 10–100 m^2, located in the south-western part of Mankhan-Elysu (Fig. 1B). They were selected from a collection of 43 relevés of psammosteppes from that area, partly published in the form of synoptic tables and interpreted as communities (Szczypek *et al.* 2005). The relevés were supplemented or corrected on the basis of verified herbarium specimens deposited in the University of Silesia in Chorzów. In the synoptic table 2 were used 25 relevés made by other authors in different regions of Eastern Siberia.

The diagnostic role of plant taxa in the system of sandy swards in Siberia was assumed as a result of a critical analysis of the syntaxonomic concepts including Chytrý *et al.* (1993), Hilbig *et al.* (1999), Hilbig and Korolyuk (2000), Brzeg and Wika (2001) as well as Dulepova and Korolyuk (2013, 2015). In describing the new syntaxon, regulations of the International Code of Phytosociological Nomenclature (ICPN, Weber *et al.* 2000) were followed.

The names of taxa of vascular plants were adopted as by Anenchonov *et al.* (2001); in the determination of herbarium material, references were also made to the flora of Malyshev and Peshkova (1979). The nomenclature of the species of mosses follows classification by Ochyra *et al.* (2003), lichens according to Fałtynowicz (2003).

RESULTS

The syntaxonomic position and a formal diagnosis of the association

Class (Cl.): ***Brometea korotkyi*** Hilbig *et* Korolyuk 2000 (=*Oxytropidetea lanatae* Brzeg *et* Wika 2001 *nom. superfl.*; *Cleistogenetea squarrosae* Mirkin *et al.* 1985 *ex*? *sensu auct. p.p.*)

Order (O.): ***Oxytropidetalia lanatae*** Brzeg *et* Wika 2001 (Non: *Brometalia korotkyi* Hilbig *et* Korolyuk 2000, Non: *Festucetalia lenensis* Mirkin *in* Gogoleva *et al.* 1987)

Alliance (All.): ***Festucion dahuricae*** Dulepova *et* Korolyuk 2015 (=*Oxytropido lanatae-Agropyrion cristati* Brzeg *et* Wika 2001 *nom. inval.*, Art. 2b, 5; Non: *Oxytropidion lanatae* Chytrý *et al.* 1993; Non: *Aconogonion chlorochrysei* Dulepova *et* Korolyuk 2013)

Association (Ass.): ***Orostachyo spinosae-Koelerietum mongolicae*** Brzeg *et* Wika 2019 *ass. nova hoc. loco* (=Zbior. – comm. *Oxytropis lanata-Koeleria cristata-Carex sp. div.* Szczypek *et al.* 2005 *nom. inval. p.min.p.*)

Nomenclatural type: Table 1, rel. 5 (orig.) *holotypus hoc loco*

Ch. Ass. (loc.): *Koeleria cristata ssp. mongolica*, *Orostachys spinosa*

D. Ass. (loc.): *Bryum caespiticium*, *Ceratodon purpureus*, *Cladonia uncialis*, *Placynthiella oligotropha*, *Pseudevernia furfuracea*, *Stereocaulon condensatum*, *Stereocaulon paschale*

Fig. 2. Appearance of a typically developed patch of *Orostachyo spinosae-Koelerietum mongolicae* in the south-western part of the Mankhan-Elysu sandy complex. Phot. S. Wika, 29.06.2004

Structure and floristic composition

Patches of *Orostachyo spinosae-Koelerietum mongolicae* (Tab. 1), unlike typically developed phytocoenoses of other associations of sandy swards of the *Festucion dahuricae* alliance (cf. Buyantuyev *et al.* 1999; Szczypek *et al.* 2000, 2005; Dulepova 2014; Dulepova, Korolyuk 2015; Namzalov *et al.* 2017) are always two-layered, consisting of a layer of herbs and another one made up of mosses and lichens.

The herb layer covers from 10% in the developmentally younger patches up to 70% in the case of advanced phases where the stoloniferous *Carex korshinskyi* is playing an increasingly important role (rel. 1 and 2). At the optimum phase, the plants building this layer are ± evenly dispersed. Besides the mentioned *Carex*, the characteristic physiognomy is affected by the impressive leaves of *Orostachys spinosa*, a rosette succulent plant with orthotropically raised generative shoots, as well as by small tufts of *Koeleria cristata ssp. mongolica* (Fig. 2) – the two characteristic taxa of the association in the Mankhan-Elysu area. The

Fig. 3. Fragment of a patch of *Orostachyo spinosae-Koelerietum mongolicae* with loose litter on the surface of sandy soil. Phot. S. Wika, 29.06.2004

constant element of the layer in question is *Artemisia ledebouriana* although the number of specimens is small. Notably, young specimens of *Pinus sylvestris* are quite frequent. The other plants in this layer play a less important role in its structure while some occur only sporadically.

The layer of mosses and lichens covers 5–20% of the soil's surface. It consists of two species of small orthotropic mosses (*Bryum caespiticium* and *Ceratodon purpureus*) as well as crustose and fruticose lichens (Tab. 1). This layer is an important diagnostic feature of the association; it is typically non-existent in patches of other associations of the *Festucion dahuricae* alliance.

Habitat conditions

The phytocoenoses of *Orostachyo spinasae-Koelerietum mongolicae* typically do not occupy large areas (maximum several ares). They tend to grow on the outskirts of sparse taiga or patches of young pine trees, on dry slopes of various expositions and angles. They tend to represent the specific ecotone vegetation between clusters of pines and large areas of *Corispermo macrocarpi-Leymetum*

crassinervii grasslands. They occupy soils like initial arenosols created from still, relatively stabilised and small-grained sand. Notably, on the surface of the soil in the studied patches there are always dead plant remains: dry sticks, conifer needles, pieces of tree bark, last year's leaves and shoots of herbs (Fig. 2 and 3).

DISCUSSION

Orostachyo spinosae-Koelerietum mongolicae is undoubtedly a new combination of species among the pioneer sandy swards of the *Brometea korotkyi* class. It probably represents an endemic association occurring only in specific natural conditions of the Mankhan-Elysu range. On a local scale, its characteristic species are *Koeleria cristata ssp. mongolica* and *Orostachys spinosa*. *Koeleria cristata ssp. mongolica* (not *K. cristata* (L.) Pers. *s.s.*) is an obligatory psammophyte occurring in Buryatia exclusively on the sandy steppes and deserts to the south of Lake Baikal, in the basins of the Dzhida and Selenge Rivers (Anenchonov *et al.* 2001). On the other hand, *Orostachys spinosa* is a rosette succulent plant from the Crassulaceae family, a relative of the European *Jovibarba* and *Sempervivum*, and a species widely spread in Siberia, considered a steppe plant. It grows typically in rocky and stony locations (Anenchonov *et al.* 2001) and on stabilised sands (Dulepova 2014). The appearance, structure and conditions of occurrence of patches of this association are close to the same features in phytocoenoses of *Peucedano oreoselini-Jovibarbetum soboliferae* (Juraszek 1928) Brzeg *et* M. Wojterska 2001 – a Central European association from the *Koelerion glaucae* (Volk 1931) Klika 1934 alliance and the class *Koelerio-Corynephoretea* Klika *in* Klika *et* Novák 1941 (cf. Zgrabczyńska, Brzeg 2009; Ratyńska *et al.* 2010).

Owing to the diagnostically important role of the species, the moss–lichen layer of *Orostachyo spinosae-Koelerietum mongolicae* is to some extent related to the *Stereocaulono condensati-Poetum argunensis* association, described in the region of Chara River (Zabaykalsky Krai) which belongs to a separate alliance *Aconogonion chlorochrysei*, identified within the *Oxytropidetalia lanatae* order (Dulepova, Korolyuk 2013). However, these associations only have few common species (*Artemisia ledebouriana*, *Ceratodon purpureus*, *Oxytropis lanata*, *Stereocaulon condensatum*) and they are significantly different.

Table 2 presents a comparison of the species composition of described association and two other ones where an important role is played by *Orostachys spinosa* as well as *Carex korshinskyi* and *Koeleria cristata s.l.* This comparison indicates that *Orostachyo spinosae-Koelerietum mongolicae* (col. 1) is clearly separate from the two remaining associations and undoubtedly belongs to the *Brometea korotkyi* class. Both *Potentillo acaulis-Thymetum baicalensis* (col. 2;

Table 2
Comparison of floristic composition of swards with *Orostachys spinosa*

Successive No.	1	2	3
Number of relevés	6	9	16
Number of taxa	28	50	57
Average number of taxa in relevé	12	20	19
I. Ch., *D. Ass. *Orostachyo spinosae–Koelerietum mongolicae*			
Koeleria cristata ssp. mongolica (Domin) Tzvelev	V^{+-2}	–	–
**Placynthiella oligotropha* (J.R. Laundon) Coppins *et* P. James	V^{+-2}	–	–
**Ceratodon purpureus* (Hedw.) Brid.	IV$^{+.2}$	–	–
**Bryum caespiticium* Hedw.	IV^{+}	–	–
**Cladonia uncialis* (L.) Weber *ex* F.H. Wigg.	II^{1}	–	–
**Stereocaulon condensatum* Hoffm.	II^{+-1}	–	–
**Pseudevernia furfuracea* (L.) Zopf	II^{+-2}	–	–
II. Ch. Cl. *Brometea korotkyi*			
Carex korshinskyi Kom.	V^{+-3}	V^{+-2}	III^{+-2}
Artemisia ledebouriana Bess.	V^{+}	–	–
Oxytropis lanata (Pall.) DC.	III^{+}	–	–
Hedysarum fruticosum Pallas	II^{+-1}	–	–
Leymus racemosus ssp. crassinervius (Kar. *et* Kir.) Tzvelev	II^{+}	–	–
Rosa acicularis Lindley	–	III^{+}	–
III. Ch. Cl. *Cleistogenetea squarrosae*			
Orostachys spinosa (L.) C.A. Mey.	V^{+-2}	V^{r-2}	III^{+-1}
Veronica incana L.	II^{+}	V^{+-1}	I^{1}
Pulsatilla turczaninovii Krylov *et* Serg.	I^{r}	II^{+-1}	II^{+-1}
Carex pediformis C.A. Mey.	I^{+}	III^{r-1}	–
Thymus baicalensis Serg.	–	V^{+-3}	–
Artemisia commutata Bess.	–	V^{r-3}	I^{+}
Galium verum L.	–	V^{+-2}	–
Poa stepposa (Krylov) Roshev.	–	IV^{+-2}	–
Pulsatilla flavescens (Zucc.) Już.	–	IV^{+-2}	–
Papaver nudicaule L.	–	IV^{+}	–
Artemisia dracunculus L.	–	II$^{1-3}$	–
Androsace lactiflora Fisch. *ex* Duby	–	II^{+}	–
Orobanche coerulescens Stephan	–	II^{+}	–
Astragalus fruticosus Pallas	–	II^{r-+}	–
Potentilla acaulis L.	–	V^{+-2}	V^{+-4}
Agropyron cristatum (L.) Beauv.	–	V^{+-2}	V^{+-2}
Koeleria cristata (L.) Pers. *s.s.*	–	IV^{+-2}	V^{r-3}
Artemisia frigida Willd.	–	III^{+-1}	V^{+-3}
Dianthus versicolor Fisch. *ex* Link	–	IV^{r-1}	III^{+-1}
Heteropappus altaicus (Willd.) Novopokr.	–	II$^{1-3}$	IV^{r-1}
Cleistogenes squarrosus (Trin.) Keng	–	–	V$^{1-4}$
Stipa krylovii Roshev.	–	–	V$^{1-4}$
Caragana pygmaea (L.) DC.	–	–	V^{+-2}
Festuca valesiaca Schleich. *ex* Gaudin	–	–	III^{+-3}
Caragana bungei Ledeb.	–	–	III^{+-2}

Carex duriuscula C.A.Mey.	–	–	III^{+-2}
Stipa sibirica L.	–	–	III^{+-1}
Allium anisopodium Ledeb.	–	–	III^{+-1}
Kochia prostrata (L.) Schraber	–	–	III^{+-1}
Poa botryoides (Trin. *ex* Griseb.) Roshev.	–	–	II^{+-2}
Iris potaninii Maxim.	–	–	II^{+-1}
Potentilla bifurca L.	–	–	II^{+-1}
Erysimum flavum (Georgi) Bobrov	–	–	II^{+}
Serratula centauroides L.	–	–	II^{+}
IV. Others			
Pinus sylvestris L. c	III^{r-+}	–	–
Dontostemon micranthus C.A. Mey.	II^{+}	–	–
Crepis tectorum L.	II^{+}	–	–
Calamagrostis epigejos (L.) Roth	II^{+-2}	II^{+-1}	–
Dracocephalum nutans L.	–	IV^{+-1}	–
Allium splendens Willd. *ex* Schult. *et* Schult.	–	III^{r-+}	–
Chenopodium album L.	–	II^{+-1}	–
Sisymbrium heteromallum C.A. Mey.	–	II^{r-1}	–
Linaria acutiloba Fisch.	–	II^{+}	–
Silene repens Patrin	–	II^{+}	–
Scorzonera radiata Fisch.	–	II^{+}	–
Camelina microcarpa Andrz.	–	II^{r-+}	–
Alyssum obovatum (C.A. Mey.) Turcz.	–	III^{+-2}	II^{+}
Chenopodium aristatum L.	–	II^{+-1}	II^{+}
Stellaria dichotoma L.	–	II^{+}	I^{+}
Parmelia kamtschadalis (Mont.) Mont.	–	–	IV^{+-3}

Shortened table
1. *Orostachyo spinosae-Koelerietum mongolicae* (Brzeg, Wika 2019 orig., tab. 1).
2. *Potentillo acaulis-Thymetum baicalensis* (Chytrý *et al.* 1993, tab. 14: rel. 4-12).
3. *Hedysaro fruticosi-Stipetum krylovii* Hilbig *et al.*1999 p.p. (Hilbig & Koroljuk 2000, tab. 2. col. 2).

an association of rock steppes described from Svyatoy Nos peninsula on the shore of Lake Baikal by Chytrý *et al.* 1993) and *Hedysaro fruticosi-Stipetum krylovii* Hilbig *et al.* 1999 *p.p.* (col. 3; a form of psammosteppe from the area of Tuva bordering with Mongolia; Hilbig and Korolyuk 2000) represent a class of steppe communities of *Cleistogenetea squarrosae*. The species characteristic of the latter class, apart from the mentioned *Orostachys spinosa* (whose diagnostic value remains uncertain), play an insignificant role in the studied association; they appear only sporadically while a majority of species from this class are non-existent. On the other hand, *Carex korshinskyi*, a pioneer species that even encroaches mobile sand, gradually stabilising it by means of subterranean stolons, we regard as a good characteristic species of the *Brometea korotkyi* class which can be preserved in more advanced phases of succession of sandy swards up to the steppe phase.

The case of *Koeleria cristata ssp. mongolica* (a psammophyte) *versus Koeleria cristata s.s.* (a steppe subspecies) indicates a requirement of precise

determination of difficult taxa when making phytosociological relevés with the subsequent syntaxonomic deliberatios in mind. This holds true for numerous genera occurring in the sandy swards and steppes of Siberia including *Aconogonon*, *Agropyron*, *Artemisia*, *Astragalus*, *Carex*, *Corispermum*, or *Leymus*.

SUMMARY

Phytosociological studies on the psammophilous vegetation complex in question were conducted using the Braun-Blanquet method in June 2004 in the south-western part of the sand areas of Mankhan-Elysu located in south-eastern Buryatia (Western Transbaikal, on the border of the Russian Federation and Mongolia).

Back then, 43 phytosociological relevés and photographic documentation were made. The preliminary results of the survey (Szczypek *et al.* 2005) led to identifying three separate phytocoenons of psammosteppes as non-hierarchical communities. A subsequent detailed analysis of the material, supplemented or corrected on the basis of verified herbarium specimens proved that besides the three plant associations already described in literature by other authors: *Thesio tuvensis-Festucetum dahuricae* Dulepova *et* Korolyuk 2015, *Corispermo macrocarpi-Leymetum crassinervi* Dulepova *et* Korolyuk 2015 (=*Leymo crassinervi-Artemisietum ledebourianae* Namzalow *et al.* 2017 *nom. inval. p.max.p.*) and *Corispermo sibirici-Oxytropidetum lanatae* Dulepova *et* Korolyuk 2015 (=*Oxytropido lanatae-Agropyretum michnoi* Namzalov *et al.* 2017 *nom. inval.*), six relevés refer to an entirely separate, new type of sandy swards.

The article presents a formal diagnosis of a new plant association *Orostachyo spinosae-Koelerietum mongolicae* and its brief floristic and habitat characteristics. It is assumed that the association is endemic to Mankhan-Elysu and related to ecotone locations between sparse coniferous Siberian taiga with prevailing pine trees and other large-area communities of psammosteppes of the *Brometea korotkyi* class. Some issues related to the syntaxonomy of the grasslands have also been discussed.

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OROSTACHYO SPINOSAE-KOELERIETUM MONGOLICAE – NOWY ZESPÓŁ MURAW PIASKOWYCH Z KLASY *BROMETEA KOROTKYI* HILBIG *ET* KOROLYUK 2000 NA OBSZARZE MANCHAN-EŁYSU (WSCHODNIA SYBERIA)

Streszczenie

Badania fitosocjologiczne roślinności psammofilnej kompleksu piaszczysk Manchan-Ełysu, położonego w południowo-wschodniej Buriacji (Zachodnie Zabajkale; pogranicze Federacji Rosyjskiej i Mongolii), prowadzone były w czerwcu 2004 roku z zastosowaniem metody Braun-Blanqueta. Wykonano wówczas (S. Wika) 43 zdjęcia fitosocjologiczne oraz sporządzono dokumentację fotograficzną. Wstępne wyniki tych badań (Szczypek i in. 2005) pozwoliły wyróżnić trzy odrębne fitocenony psammostepów w randze niehierarchicznych zbiorowisk. Późniejsza szczegółowa analiza tego materiału, uzupełnionego lub skorygowanego na podstawie sprawdzonych alegatów zielnikowych, wykazała, że oprócz trzech zespołów roślinnych opisanych już w literaturze przez innych autorów: *Thesio tuvensis-Festucetum dahuricae* Dulepova *et* Korolyuk 2015, *Corispermo macrocarpi-Leymetum crassinervi* Dulepova *et* Korolyuk 2015 (= *Leymo crassinervi-Artemisietum ledebourianae* Namzałow *et al.* 2017 *nom. inval. p.max.p.*) i *Corispermo sibirici-Oxytropidetum lanatae* Dulepova *et* Korolyuk 2015 (= *Oxytropido lanatae-Agropyretum michnoi* Namzalov *et al.* 2017 *nom. inval.*), 6 zdjęć odnosi się do zupełnie odrębnego od wymienionych, nowego typu muraw piaskowych.

W artykule przedstawiono formalną diagnozę nowego zespołu roślinnego *Orostachyo spinosae-Koelerietum mongolicae* i jego krótką charakterystykę florystyczną i siedliskową. Przypuszcza się, że jest to zespół endemiczny dla obszaru Manchan-Ełysu, związany z położeniami ekotonowymi między świetlistą tajgą syberyjską z dominacją sosny a innymi wielkopowierzchiowymi zbiorowiskami psammostepów klasy *Brometea korotkyi*. Przedyskutowano niektóre zagadnienia związane syntaksonomią tych muraw.